

SEQUENCE LISTING

<110> Washington State University Research Foundation
Mealey, Katrina
Bentjen, Steven

<120> MDR1 VARIANTS AND METHODS FOR THEIR USE

<130> 4630-61733

<150> US 60/261,578

<151> 2001-01-12

<150> US 60/314,829

<151> 2001-08-24

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<170> PatentIn version 3.1

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Met Asp Pro Glu Gly Gly Arg Lys Gly Ser Ala Glu Lys Asn
1 5 10

ttc tgg aaa atg ggc aaa aaa agt aaa aaa gag aag aaa gaa aag aaa 159
Phe Trp Lys Met Gly Lys Lys Ser Lys Lys Glu Lys Lys Glu Lys Lys
15 20 25 30

cca act gtc agc acg ttt gca atg ttt cgc tat tca aat tgg ctt gat 207
Pro Thr Val Ser Thr Phe Ala Met Phe Arg Tyr Ser Asn Trp Leu Asp
35 40 45

agg ttg tat atg ttg gtg ggg aca atg gct gcc atc atc cat gga gct 255
Arg Leu Tyr Met Leu Val Gly Thr Met Ala Ala Ile Ile His Gly Ala
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Ala Leu Pro Leu Met Met Leu Val Phe Gly Asn Met Thr Asp Ser Phe
65 70 75

gca aat gca gga att tca aga aac aaa act ttt cca gtt ata att aat 351
Ala Asn Ala Gly Ile Ser Arg Asn Lys Thr Phe Pro Val Ile Ile Asn
80 85 90

gaa agt att acg aac aat aca caa cat ttc atc aac cat ctg gag gag 399
Glu Ser Ile Thr Asn Asn Thr Gln His Phe Ile Asn His Leu Glu Glu
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| gaa atg acc acg tat gcc tat tat tac agt ggg atc ggt gct ggc gtg | 447 |
| Glu Met Thr Thr Tyr Ala Tyr Tyr Tyr Ser Gly Ile Gly Ala Gly Val | |
| 115 120 125 | |
| ctg gtg gct gct tac atc cag gtt tca ttc tgg tgc ctg gca gca gga | 495 |
| Leu Val Ala Ala Tyr Ile Gln Val Ser Phe Trp Cys Leu Ala Ala Gly | |
| 130 135 140 | |
| aga cag ata ctc aaa att aga aaa caa ttt ttt cat gct atc atg cga | 543 |
| Arg Gln Ile Leu Lys Ile Arg Lys Gln Phe Phe His Ala Ile Met Arg | |
| 145 150 155 | |
| cag gag att ggc tgg ttt gac gtg cat gac gtt ggg gag ctt aac acc | 591 |
| Gln Glu Ile Gly Trp Phe Asp Val His Asp Val Gly Glu Leu Asn Thr | |
| 160 165 170 | |
| cgg ctc aca gac gat gtc tcc aaa atc aat gaa gga att ggc gac aaa | 639 |
| Arg Leu Thr Asp Asp Val Ser Lys Ile Asn Glu Gly Ile Gly Asp Lys | |
| 175 180 185 190 | |
| gtt gga atg ttc ttt caa tca ata gca aca ttt ttc acc ggt ttt ata | 687 |
| Val Gly Met Phe Phe Gln Ser Ile Ala Thr Phe Phe Thr Gly Phe Ile | |
| 195 200 205 | |
| gtg ggg ttt aca cct ggt tgg aag cta acc ctt gtg att ttg gcc atc | 735 |
| Val Gly Phe Thr Pro Gly Trp Lys Leu Thr Leu Val Ile Leu Ala Ile | |
| 210 215 220 | |
| agc cct gtt ctt gga ctt tca gcc gcc atc tgg gca aag ata cta tct | 783 |
| Ser Pro Val Leu Gly Leu Ser Ala Ala Ile Trp Ala Lys Ile Leu Ser | |
| 225 230 235 | |
| tca ttt act gat aaa gaa ctc ttg gcc tat gca aaa gct gga gca gta | 831 |
| Ser Phe Thr Asp Lys Glu Leu Leu Ala Tyr Ala Lys Ala Gly Ala Val | |
| 240 245 250 | |
| gct gaa gaa gtc tta gca gca atc aga act gtg att gcc ttt gga gga | 879 |
| Ala Glu Glu Val Leu Ala Ala Ile Arg Thr Val Ile Ala Phe Gly Gly | |
| 255 260 265 270 | |
| caa aag aaa gaa ctt gaa agg tac aac aaa aat tta gaa gaa gct aaa | 927 |
| Gln Lys Lys Glu Leu Glu Arg Tyr Asn Lys Asn Leu Glu Glu Ala Lys | |
| 275 280 285 | |
| aga att ggg ata aag aaa gct atc acg gcc aac att tct att ggt gcc | 975 |
| Arg Ile Gly Ile Lys Lys Ala Ile Thr Ala Asn Ile Ser Ile Gly Ala | |
| 290 295 300 | |
| gct ttc tta ttg atc tat gca tca tat gct ctg gct ttc tgg tat ggg | 1023 |
| Ala Phe Leu Leu Ile Tyr Ala Ser Tyr Ala Leu Ala Phe Trp Tyr Gly | |
| 305 310 315 | |
| acc tcc ttg gtc ctc tcc agt gaa tat act att gga cag gta ctc act | 1071 |
| Thr Ser Leu Val Leu Ser Ser Glu Tyr Thr Ile Gly Gln Val Leu Thr | |
| 320 325 330 | |
| gtc ttc ttt tct gta tta att ggg gct ttt agt att gga cag gca tcc | 1119 |
| Val Phe Phe Ser Val Leu Ile Gly Ala Phe Ser Ile Gly Gln Ala Ser | |
| 335 340 345 350 | |

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| Pro Ser Ile Glu Ala Phe Ala Asn Ala Arg Gly Ala Ala Tyr Glu Ile | |
| 355 360 365 | |
| ttc aag ata att gac aat aaa cca agc att gac agc tat tcg aag agt | 1215 |
| Phe Lys Ile Ile Asp Asn Lys Pro Ser Ile Asp Ser Tyr Ser Lys Ser | |
| 370 375 380 | |
| gga cat aaa cca gat aat att aag gga aat ttg gaa ttc aaa aat gtt | 1263 |
| Gly His Lys Pro Asp Asn Ile Lys Gly Asn Leu Glu Phe Lys Asn Val | |
| 385 390 395 | |
| cac ttc agt tac cct tct cga aaa gaa gtt aag atc tta aag ggt ctc | 1311 |
| His Phe Ser Tyr Pro Ser Arg Lys Glu Val Lys Ile Leu Lys Gly Leu | |
| 400 405 410 | |
| aac ctg aag gtt cag agt ggg cag aca gtg gcg ctg gtt ggg aac agt | 1359 |
| Asn Leu Lys Val Gln Ser Gly Gln Thr Val Ala Leu Val Gly Asn Ser | |
| 415 420 425 430 | |
| ggc tgc ggg aag agc acg acc gtg cag ctg atg cag agg ctc tat gac | 1407 |
| Gly Cys Gly Lys Ser Thr Thr Val Gln Leu Met Gln Arg Leu Tyr Asp | |
| 435 440 445 | |
| ccc aca gat ggc atg gtc tgt att gat gga cag gac att agg acc ata | 1455 |
| Pro Thr Asp Gly Met Val Cys Ile Asp Gly Gln Asp Ile Arg Thr Ile | |
| 450 455 460 | |
| aat gta agg cat ctt cgg gaa att act ggt gtg gtg agt cag gag cct | 1503 |
| Asn Val Arg His Leu Arg Glu Ile Thr Gly Val Val Ser Gln Glu Pro | |
| 465 470 475 | |
| gtg ttg ttt gcc acc acg ata gct gaa aac att cgc tat ggc cgc gaa | 1551 |
| Val Leu Phe Ala Thr Thr Ile Ala Glu Asn Ile Arg Tyr Gly Arg Glu | |
| 480 485 490 | |
| aat gtc acc atg gat gag att gag aaa gct gtt aag gaa gcc aat gcc | 1599 |
| Asn Val Thr Met Asp Glu Ile Glu Lys Ala Val Lys Glu Ala Asn Ala | |
| 495 500 505 510 | |
| tat gat ttt atc atg aaa cta cct aat aaa ttt gac act ctg gtt gga | 1647 |
| Tyr Asp Phe Ile Met Lys Leu Pro Asn Lys Phe Asp Thr Leu Val Gly | |
| 515 520 525 | |
| gag aga ggg gcc cgg ctg agt ggt gga cag aaa cag aga atc gcc att | 1695 |
| Glu Arg Gly Ala Arg Leu Ser Gly Gly Gln Lys Gln Arg Ile Ala Ile | |
| 530 535 540 | |
| gct cgg gcc ctg gtt cgc aac ccc aag att ctt ctg ctg gat gag gca | 1743 |
| Ala Arg Ala Leu Val Arg Asn Pro Lys Ile Leu Leu Leu Asp Glu Ala | |
| 545 550 555 | |
| acg tca gct ctg gac act gaa agt gaa gca gtg gtt cag gtg gcc ctg | 1791 |
| Thr Ser Ala Leu Asp Thr Glu Ser Glu Ala Val Val Gln Val Ala Leu | |
| 560 565 570 | |
| gat aag gcc aga aaa ggc cgg act acc att gtg ata gct cat cgt ttg | 1839 |
| Asp Lys Ala Arg Lys Gly Arg Thr Thr Ile Val Ile Ala His Arg Leu | |
| 575 580 585 590 | |
| tct aca gtt cgt aat gcc gat gtc att gct ggt ttt gat gat gga gtc | 1887 |

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Ser | Thr | Val | Arg | Asn | Ala | Asp | Val | Ile | Ala | Gly | Phe | Asp | Asp | Gly | Val | | |
| | | | | 595 | | | | | 600 | | | | | 605 | | | |
| att | gtg | gag | aaa | gga | aat | cat | gat | gaa | ctc | atg | aaa | gag | aag | ggc | att | 1935 | |
| Ile | Val | Glu | Lys | Gly | Asn | His | Asp | Glu | Leu | Met | Lys | Glu | Lys | Gly | Ile | | |
| | | | 610 | | | | | 615 | | | | | 620 | | | | |
| tac | ttc | aaa | ctt | gtc | aca | atg | cag | aca | aga | gga | aat | gaa | att | gag | tta | 1983 | |
| Tyr | Phe | Lys | Leu | Val | Thr | Met | Gln | Thr | Arg | Gly | Asn | Glu | Ile | Glu | Leu | | |
| | | 625 | | | | | 630 | | | | | 635 | | | | | |
| gaa | aat | gcc | act | ggt | gaa | tcc | aaa | agt | gaa | agt | gat | gcc | ttg | gaa | atg | 2031 | |
| Glu | Asn | Ala | Thr | Gly | Glu | Ser | Lys | Ser | Glu | Ser | Asp | Ala | Leu | Glu | Met | | |
| | 640 | | | | | 645 | | | | | 650 | | | | | | |
| tct | cca | aaa | gat | tca | ggg | tcc | agt | tta | ata | aaa | aga | aga | tca | act | cgc | 2079 | |
| Ser | Pro | Lys | Asp | Ser | Gly | Ser | Ser | Leu | Ile | Lys | Arg | Arg | Ser | Thr | Arg | | |
| 655 | | | | | 660 | | | | | 665 | | | | | 670 | | |
| agg | agt | ata | cat | gca | cca | caa | ggc | caa | gac | aga | aag | ctt | ggt | aca | aaa | 2127 | |
| Arg | Ser | Ile | His | Ala | Pro | Gln | Gly | Gln | Asp | Arg | Lys | Leu | Gly | Thr | Lys | | |
| | | | | 675 | | | | | 680 | | | | | 685 | | | |
| gag | gac | ttg | aat | gag | aat | gtt | cct | tca | gtt | tcc | ttc | tgg | agg | att | ctg | 2175 | |
| Glu | Asp | Leu | Asn | Glu | Asn | Val | Pro | Ser | Val | Ser | Phe | Trp | Arg | Ile | Leu | | |
| | | | 690 | | | | | 695 | | | | | 700 | | | | |
| aag | ctg | aac | tca | act | gaa | tgg | cct | tat | ttt | gtg | gtt | ggt | ata | ttt | tgt | 2223 | |
| Lys | Leu | Asn | Ser | Thr | Glu | Trp | Pro | Tyr | Phe | Val | Val | Gly | Ile | Phe | Cys | | |
| | | 705 | | | | | 710 | | | | | 715 | | | | | |
| gct | att | ata | aac | gga | ggc | ctg | caa | cca | gca | ttt | tca | ata | ata | ttt | tca | 2271 | |
| Ala | Ile | Ile | Asn | Gly | Gly | Leu | Gln | Pro | Ala | Phe | Ser | Ile | Ile | Phe | Ser | | |
| | 720 | | | | | 725 | | | | | 730 | | | | | | |
| agg | att | ata | ggg | atc | ttt | acc | cga | gat | gag | gat | cct | gaa | aca | aaa | cga | 2319 | |
| Arg | Ile | Ile | Gly | Ile | Phe | Thr | Arg | Asp | Glu | Asp | Pro | Glu | Thr | Lys | Arg | | |
| 735 | | | | 740 | | | | | 745 | | | | | 750 | | | |
| cag | aat | agt | aac | atg | ttt | tct | gta | ttg | ttt | cta | gtc | ctt | gga | att | att | 2367 | |
| Gln | Asn | Ser | Asn | Met | Phe | Ser | Val | Leu | Phe | Leu | Val | Leu | Gly | Ile | Ile | | |
| | | | 755 | | | | | 760 | | | | | | 765 | | | |
| tct | ttt | att | aca | ttt | ttc | ctc | cag | ggc | ttc | aca | ttt | ggc | aaa | gct | ggg | 2415 | |
| Ser | Phe | Ile | Thr | Phe | Phe | Leu | Gln | Gly | Phe | Thr | Phe | Gly | Lys | Ala | Gly | | |
| | | | 770 | | | | | 775 | | | | | 780 | | | | |
| gag | atc | ctc | act | aag | cgg | ctt | cga | tac | atg | gtt | ttc | aga | tcc | atg | ctg | 2463 | |
| Glu | Ile | Leu | Thr | Lys | Arg | Leu | Arg | Tyr | Met | Val | Phe | Arg | Ser | Met | Leu | | |
| | | 785 | | | | | 790 | | | | | 795 | | | | | |
| aga | cag | gat | gtc | agc | tgg | ttt | gat | gac | cct | aaa | aac | acc | act | gga | gca | 2511 | |
| Arg | Gln | Asp | Val | Ser | Trp | Phe | Asp | Asp | Pro | Lys | Asn | Thr | Thr | Gly | Ala | | |
| | 800 | | | | | 805 | | | | | 810 | | | | | | |
| ttg | aca | acc | agg | ctt | gcc | aat | gat | gcg | gct | caa | gtt | aaa | ggg | gct | ata | 2559 | |
| Leu | Thr | Thr | Arg | Leu | Ala | Asn | Asp | Ala | Ala | Gln | Val | Lys | Gly | Ala | Ile | | |
| 815 | | | | | 820 | | | | | 825 | | | | | 830 | | |
| ggt | tcc | agg | ctt | gct | gtc | att | acc | cag | aat | ata | gca | aat | ctt | ggg | aca | 2607 | |
| Gly | Ser | Arg | Leu | Ala | Val | Ile | Thr | Gln | Asn | Ile | Ala | Asn | Leu | Gly | Thr | | |

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| 835 | | | | | | | | 840 | | | | 845 | | | | |
|---------------------------------|---------------------------------|------|--|--|--|--|--|-----|--|--|--|-----|--|--|--|--|
| ggc att att ata tcc tta atc tat | ggg tgg caa tta aca ctt tta ctc | 2655 | | | | | | | | | | | | | | |
| Gly Ile Ile Ile Ser Leu Ile Tyr | Gly Trp Gln Leu Thr Leu Leu Leu | | | | | | | | | | | | | | | |
| 850 | 855 | 860 | | | | | | | | | | | | | | |
| tta gca att gta ccc atc att gca | ata gca gga gtt gtt gaa atg aaa | 2703 | | | | | | | | | | | | | | |
| Leu Ala Ile Val Pro Ile Ile Ala | Ile Ala Gly Val Val Glu Met Lys | | | | | | | | | | | | | | | |
| 865 | 870 | 875 | | | | | | | | | | | | | | |
| atg ttg tct gga caa gca ctg aaa | gat aag aaa gag cta gaa gga gct | 2751 | | | | | | | | | | | | | | |
| Met Leu Ser Gly Gln Ala Leu Lys | Asp Lys Lys Glu Leu Glu Gly Ala | | | | | | | | | | | | | | | |
| 880 | 885 | 890 | | | | | | | | | | | | | | |
| ggg aag att gct aca gaa gcc atc | gaa aac ttc cga act gtt gtt tct | 2799 | | | | | | | | | | | | | | |
| Gly Lys Ile Ala Thr Glu Ala Ile | Glu Asn Phe Arg Thr Val Val Ser | | | | | | | | | | | | | | | |
| 895 | 900 | 905 | | | | | | | | | | | | | | |
| ttg act cgg gag cag aag ttt gaa | tac atg tat gca cag agt ttg caa | 2847 | | | | | | | | | | | | | | |
| Leu Thr Arg Glu Gln Lys Phe Glu | Tyr Met Tyr Ala Gln Ser Leu Gln | | | | | | | | | | | | | | | |
| 915 | 920 | 925 | | | | | | | | | | | | | | |
| gta cca tac aga aac tct ttg agg | aaa gca cac atc ttc ggg gtc tca | 2895 | | | | | | | | | | | | | | |
| Val Pro Tyr Arg Asn Ser Leu Arg | Lys Ala His Ile Phe Gly Val Ser | | | | | | | | | | | | | | | |
| 930 | 935 | 940 | | | | | | | | | | | | | | |
| ttt tct atc acc cag gca atg atg | tat ttt tcc tat gct ggc tgt ttc | 2943 | | | | | | | | | | | | | | |
| Phe Ser Ile Thr Gln Ala Met Met | Tyr Phe Ser Tyr Ala Gly Cys Phe | | | | | | | | | | | | | | | |
| 945 | 950 | 955 | | | | | | | | | | | | | | |
| cgg ttt ggt gcc tac ttg gtg gca | aat gag ttc atg aac ttt cag gat | 2991 | | | | | | | | | | | | | | |
| Arg Phe Gly Ala Tyr Leu Val Ala | Asn Glu Phe Met Asn Phe Gln Asp | | | | | | | | | | | | | | | |
| 960 | 965 | 970 | | | | | | | | | | | | | | |
| gtt ctt ttg gta ttc tca gct att | gtc ttt ggt gcc atg gca gtg ggg | 3039 | | | | | | | | | | | | | | |
| Val Leu Leu Val Phe Ser Ala Ile | Val Phe Gly Ala Met Ala Val Gly | | | | | | | | | | | | | | | |
| 975 | 980 | 985 | | | | | | | | | | | | | | |
| cag gtc agt tca ttt gct cct gac | tat gcc aaa gcc aaa gta tca gca | 3087 | | | | | | | | | | | | | | |
| Gln Val Ser Ser Phe Ala Pro Asp | Tyr Ala Lys Ala Lys Val Ser Ala | | | | | | | | | | | | | | | |
| 995 | 1000 | 1005 | | | | | | | | | | | | | | |
| gcc cac gtc atc atg atc att gaa | aaa agc cct ctg att gac agc | 3132 | | | | | | | | | | | | | | |
| Ala His Val Ile Met Ile Ile Glu | Lys Ser Pro Leu Ile Asp Ser | | | | | | | | | | | | | | | |
| 1010 | 1015 | 1020 | | | | | | | | | | | | | | |
| tac agc cct cac ggc ctc aag cca | aat acg ttg gaa gga aat gtg | 3177 | | | | | | | | | | | | | | |
| Tyr Ser Pro His Gly Leu Lys Pro | Asn Thr Leu Glu Gly Asn Val | | | | | | | | | | | | | | | |
| 1025 | 1030 | 1035 | | | | | | | | | | | | | | |
| aca ttt aat gag gtc gtg ttc aac | tat ccc act cga cca gac atc | 3222 | | | | | | | | | | | | | | |
| Thr Phe Asn Glu Val Val Phe Asn | Tyr Pro Thr Arg Pro Asp Ile | | | | | | | | | | | | | | | |
| 1040 | 1045 | 1050 | | | | | | | | | | | | | | |
| ccc gtg ctc cag ggg ctg agc ctc | gag gtg aag aag ggc cag acg | 3267 | | | | | | | | | | | | | | |
| Pro Val Leu Gln Gly Leu Ser Leu | Glu Val Lys Lys Gly Gln Thr | | | | | | | | | | | | | | | |
| 1055 | 1060 | 1065 | | | | | | | | | | | | | | |
| ctg gcc ctc gta ggt agc agt ggc | tgt ggg aag agc aca gtt gtt | 3312 | | | | | | | | | | | | | | |
| Leu Ala Leu Val Gly Ser Ser Gly | Cys Gly Lys Ser Thr Val Val | | | | | | | | | | | | | | | |
| 1070 | 1075 | 1080 | | | | | | | | | | | | | | |

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|-----------------------|-----------------------|-----------------------|------------|------|
| cag ctc cta gag | cgc ttc tat gac | ccc ttg gct ggt tca | gtg cta | 3357 |
| Gln Leu Leu Glu | Arg Phe Tyr Asp | Pro Leu Ala Gly Ser | Val Leu | |
| 1085 | | 1090 | 1095 | |
| att gat ggc aaa | gag ata aag cac | ctg aat gtc cag tgg | ctc cga | 3402 |
| Ile Asp Gly Lys | Glu Ile Lys His | Leu Asn Val Gln Trp | Leu Arg | |
| 1100 | | 1105 | 1110 | |
| gca cac ctg ggc | atc gtg tct cag | gag ccc atc ctg ttt | gac tgc | 3447 |
| Ala His Leu Gly | Ile Val Ser Gln | Glu Pro Ile Leu Phe | Asp Cys | |
| 1115 | | 1120 | 1125 | |
| agc att gcc gag | aac att gcc tat | gga gac aac agc cgg | gtc gta | 3492 |
| Ser Ile Ala Glu | Asn Ile Ala Tyr | Gly Asp Asn Ser Arg | Val Val | |
| 1130 | | 1135 | 1140 | |
| tca cat gaa gag | att atg cag gca | gcc aag gag gcc aac | ata cac | 3537 |
| Ser His Glu Glu | Ile Met Gln Ala | Ala Lys Glu Ala Asn | Ile His | |
| 1145 | | 1150 | 1155 | |
| cac ttc atc gag | aca ctc cct gag | aaa tac aac acc aga | gta gga | 3582 |
| His Phe Ile Glu | Thr Leu Pro Glu | Lys Tyr Asn Thr Arg | Val Gly | |
| 1160 | | 1165 | 1170 | |
| gac aaa gga acc | cag ctc tct ggt | ggc cag aaa cag cgc | att gcc | 3627 |
| Asp Lys Gly Thr | Gln Leu Ser Gly | Gly Gln Lys Gln Arg | Ile Ala | |
| 1175 | | 1180 | 1185 | |
| ata gct cgc gct | ctt gtt aga cag | cct cat att ttg ctt | ttg gat | 3672 |
| Ile Ala Arg Ala | Leu Val Arg Gln | Pro His Ile Leu Leu | Leu Asp | |
| 1190 | | 1195 | 1200 | |
| gaa gct aca tca | gct ctg gat aca | gaa agt gaa aag gtt | gtc caa | 3717 |
| Glu Ala Thr Ser | Ala Leu Asp Thr | Glu Ser Glu Lys Val | Val Gln | |
| 1205 | | 1210 | 1215 | |
| gaa gcc ctg gac | aaa gcc aga gaa | ggc cgc acc tgc att | gtg atc | 3762 |
| Glu Ala Leu Asp | Lys Ala Arg Glu | Gly Arg Thr Cys Ile | Val Ile | |
| 1220 | | 1225 | 1230 | |
| gcc cac cgc ttg | tcc acc atc cag | aat gca gat tta ata | gtg gtg | 3807 |
| Ala His Arg Leu | Ser Thr Ile Gln | Asn Ala Asp Leu Ile | Val Val | |
| 1235 | | 1240 | 1245 | |
| ttt cag aat ggc | aaa gtc aag gag | cat ggc aca cat caa | cag ctg | 3852 |
| Phe Gln Asn Gly | Lys Val Lys Glu | His Gly Thr His Gln | Gln Leu | |
| 1250 | | 1255 | 1260 | |
| ctg gct cag aaa | ggc atc tat ttt | tcc atg atc agt gtc | cag gct | 3897 |
| Leu Ala Gln Lys | Gly Ile Tyr Phe | Ser Met Ile Ser Val | Gln Ala | |
| 1265 | | 1270 | 1275 | |
| gga gca aag cgc | tag tgaactgtgg | ccatagagc tgtaaataat | tttttaatat | 3952 |
| Gly Ala Lys Arg | | | | |
| 1280 | | | | |
| ttgtgttaaa acatggcatt | taatcaaagt taaaaggtga | gcacttactg gaaaaactat | | 4012 |
| gtagaactac ctgtttaaca | tttcttgctg caactgaaga | tcattccacc aagttcagag | | 4072 |

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Val Ser Thr Phe Ala Met Phe Arg Tyr Ser Asn Trp Leu Asp Arg Leu
 35 40 45

Tyr Met Leu Val Gly Thr Met Ala Ala Ile Ile His Gly Ala Ala Leu
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Pro Leu Met Met Leu Val Phe Gly Asn Met Thr Asp Ser Phe Ala Asn
 65 70 75 80

Ala Gly Ile Ser Arg Asn Lys Thr Phe Pro Val Ile Ile Asn Glu Ser
 85 90 95

Ile Thr Asn Asn Thr Gln His Phe Ile Asn His Leu Glu Glu Glu Met
 100 105 110

Thr Thr Tyr Ala Tyr Tyr Tyr Ser Gly Ile Gly Ala Gly Val Leu Val
 115 120 125

Ala Ala Tyr Ile Gln Val Ser Phe Trp Cys Leu Ala Ala Gly Arg Gln
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Ile Leu Lys Ile Arg Lys Gln Phe Phe His Ala Ile Met Arg Gln Glu
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Ile Gly Trp Phe Asp Val His Asp Val Gly Glu Leu Asn Thr Arg Leu
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Thr Asp Asp Val Ser Lys Ile Asn Glu Gly Ile Gly Asp Lys Val Gly
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Met Phe Phe Gln Ser Ile Ala Thr Phe Phe Thr Gly Phe Ile Val Gly
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Phe Thr Pro Gly Trp Lys Leu Thr Leu Val Ile Leu Ala Ile Ser Pro
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Val Leu Gly Leu Ser Ala Ala Ile Trp Ala Lys Ile Leu Ser Ser Phe
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Thr Asp Lys Glu Leu Leu Ala Tyr Ala Lys Ala Gly Ala Val Ala Glu
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Glu Val Leu Ala Ala Ile Arg Thr Val Ile Ala Phe Gly Gly Gln Lys
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Lys Glu Leu Glu Arg Tyr Asn Lys Asn Leu Glu Glu Ala Lys Arg Ile
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Gly Ile Lys Lys Ala Ile Thr Ala Asn Ile Ser Ile Gly Ala Ala Phe
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Leu Leu Ile Tyr Ala Ser Tyr Ala Leu Ala Phe Trp Tyr Gly Thr Ser
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Leu Val Leu Ser Ser Glu Tyr Thr Ile Gly Gln Val Leu Thr Val Phe
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Phe Ser Val Leu Ile Gly Ala Phe Ser Ile Gly Gln Ala Ser Pro Ser
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Ile Glu Ala Phe Ala Asn Ala Arg Gly Ala Ala Tyr Glu Ile Phe Lys
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Ile Ile Asp Asn Lys Pro Ser Ile Asp Ser Tyr Ser Lys Ser Gly His
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Lys Pro Asp Asn Ile Lys Gly Asn Leu Glu Phe Lys Asn Val His Phe
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Ser Tyr Pro Ser Arg Lys Glu Val Lys Ile Leu Lys Gly Leu Asn Leu
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Lys Val Gln Ser Gly Gln Thr Val Ala Leu Val Gly Asn Ser Gly Cys
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Gly Lys Ser Thr Thr Val Gln Leu Met Gln Arg Leu Tyr Asp Pro Thr
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Asp Gly Met Val Cys Ile Asp Gly Gln Asp Ile Arg Thr Ile Asn Val
450 455 460

Arg His Leu Arg Glu Ile Thr Gly Val Val Ser Gln Glu Pro Val Leu
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Phe Ala Thr Thr Ile Ala Glu Asn Ile Arg Tyr Gly Arg Glu Asn Val
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Thr Met Asp Glu Ile Glu Lys Ala Val Lys Glu Ala Asn Ala Tyr Asp
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Phe Ile Met Lys Leu Pro Asn Lys Phe Asp Thr Leu Val Gly Glu Arg
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Gly Ala Arg Leu Ser Gly Gly Gln Lys Gln Arg Ile Ala Ile Ala Arg
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Ala Leu Val Arg Asn Pro Lys Ile Leu Leu Leu Asp Glu Ala Thr Ser
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Ala Leu Asp Thr Glu Ser Glu Ala Val Val Gln Val Ala Leu Asp Lys
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Ala Arg Lys Gly Arg Thr Thr Ile Val Ile Ala His Arg Leu Ser Thr
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Val Arg Asn Ala Asp Val Ile Ala Gly Phe Asp Asp Gly Val Ile Val
595 600 605

Glu Lys Gly Asn His Asp Glu Leu Met Lys Glu Lys Gly Ile Tyr Phe
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Lys Leu Val Thr Met Gln Thr Arg Gly Asn Glu Ile Glu Leu Glu Asn
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Ala Thr Gly Glu Ser Lys Ser Glu Ser Asp Ala Leu Glu Met Ser Pro
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Lys Asp Ser Gly Ser Ser Leu Ile Lys Arg Arg Ser Thr Arg Arg Ser

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660

665

670

Ile His Ala Pro Gln Gly Gln Asp Arg Lys Leu Gly Thr Lys Glu Asp
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Leu Asn Glu Asn Val Pro Ser Val Ser Phe Trp Arg Ile Leu Lys Leu
690 695 700

Asn Ser Thr Glu Trp Pro Tyr Phe Val Val Gly Ile Phe Cys Ala Ile
705 710 715 720

Ile Asn Gly Gly Leu Gln Pro Ala Phe Ser Ile Ile Phe Ser Arg Ile
725 730 735

Ile Gly Ile Phe Thr Arg Asp Glu Asp Pro Glu Thr Lys Arg Gln Asn
740 745 750

Ser Asn Met Phe Ser Val Leu Phe Leu Val Leu Gly Ile Ile Ser Phe
755 760 765

Ile Thr Phe Phe Leu Gln Gly Phe Thr Phe Gly Lys Ala Gly Glu Ile
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Leu Thr Lys Arg Leu Arg Tyr Met Val Phe Arg Ser Met Leu Arg Gln
785 790 795 800

Asp Val Ser Trp Phe Asp Asp Pro Lys Asn Thr Thr Gly Ala Leu Thr
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Thr Arg Leu Ala Asn Asp Ala Ala Gln Val Lys Gly Ala Ile Gly Ser
820 825 830

Arg Leu Ala Val Ile Thr Gln Asn Ile Ala Asn Leu Gly Thr Gly Ile
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Ile Ile Ser Leu Ile Tyr Gly Trp Gln Leu Thr Leu Leu Leu Ala
850 855 860

Ile Val Pro Ile Ile Ala Ile Ala Gly Val Val Glu Met Lys Met Leu
865 870 875 880

Ser Gly Gln Ala Leu Lys Asp Lys Lys Glu Leu Glu Gly Ala Gly Lys
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Ile Ala Thr Glu Ala Ile Glu Asn Phe Arg Thr Val Val Ser Leu Thr
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Arg Glu Gln Lys Phe Glu Tyr Met Tyr Ala Gln Ser Leu Gln Val Pro
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Tyr Arg Asn Ser Leu Arg Lys Ala His Ile Phe Gly Val Ser Phe Ser
930 935 940

Ile Thr Gln Ala Met Met Tyr Phe Ser Tyr Ala Gly Cys Phe Arg Phe
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Gly Ala Tyr Leu Val Ala Asn Glu Phe Met Asn Phe Gln Asp Val Leu
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Leu Val Phe Ser Ala Ile Val Phe Gly Ala Met Ala Val Gly Gln Val
980 985 990

Ser Ser Phe Ala Pro Asp Tyr Ala Lys Ala Lys Val Ser Ala Ala His
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Val Ile Met Ile Ile Glu Lys Ser Pro Leu Ile Asp Ser Tyr Ser
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Pro His Gly Leu Lys Pro Asn Thr Leu Glu Gly Asn Val Thr Phe
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Asn Glu Val Val Phe Asn Tyr Pro Thr Arg Pro Asp Ile Pro Val
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Leu Gly Ile Val Ser Gln Glu Pro Ile Leu Phe Asp Cys Ser Ile
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Glu Glu Ile Met Gln Ala Ala Lys Glu Ala Asn Ile His His Phe
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Ile Glu Thr Leu Pro Glu Lys Tyr Asn Thr Arg Val Gly Asp Lys
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Gly Thr Gln Leu Ser Gly Gly Gln Lys Gln Arg Ile Ala Ile Ala
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Arg Ala Leu Val Arg Gln Pro His Ile Leu Leu Leu Asp Glu Ala
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Thr Ser Ala Leu Asp Thr Glu Ser Glu Lys Val Val Gln Glu Ala
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